Thermo-Acoustic Convertor for Space Power, Phase I

Completed Technology Project (2006 - 2006)

Project Introduction

Sunpower will introduce thermoacoustic Stirling heat engine (TASHE) technology into its existing Stirling convertor technology to eliminate the moving mechanical displacer. The displacer function will be performed by a thermal buffer tube and supporting thermoacoustic components containing no moving mechanical parts. Sunpower's linear alternator will be retained, except re-sized to accommodate the power of the TASHE. TASHE technology has evolved independently, spearheaded by efforts at Los Alamos National Laboratory and typically packages components (heat exchangers, thermal buffer tube) in a physically different layout than typical Stirling convertor technology. The innovation here is to recognize the similarity between components and repackage the thermoacoustic components as closely as possible to the proven layout used for Sunpower's engines. In this way it will be possible to make direct comparisons of size, weight and efficiency between thermoacoustic and displacer-type Stirling convertors. The research will help NASA assess the relative benefits of thermoacoustic and displacer-type Stirling convertors for space power applications and may lead to technology uniquely suited to some missions where displacer-type technology is unacceptable for whatever reason. In Phase 1 we will optimize the concentric TASHE design to provide as much electrical output as possible from a single GPHS (nominally 220 W of heat delivered to the convertor). This design will use the same temperature levels currently used for the ASC convertor of 850 C hot end and 90 C reject. This will provide a direct comparison of size, mass, and efficiency differences between TASHE and displacer type convertors designed for the same application and using the same temperature levels. During Phase 1 we will also scale up this basic TASHE to a higher output power (~400W), and higher temperature levels, to provide a conceptual design of a high efficiency TASHE suited for Venus exploration.

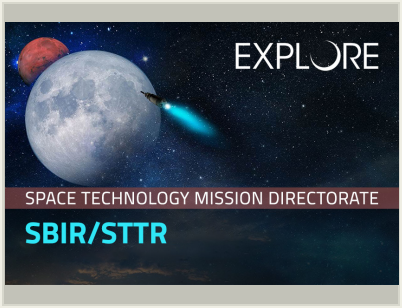

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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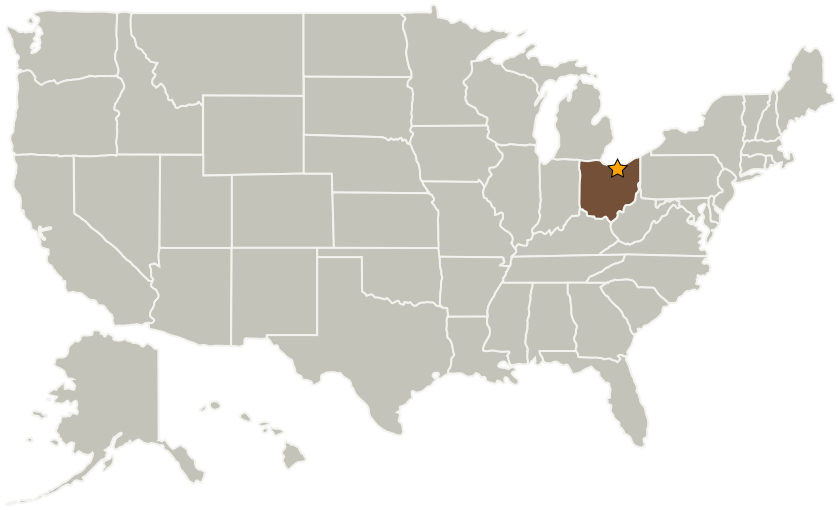
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
Sunpower, Inc.	Supporting Organization	Industry	Athens, Ohio

Primary U.S. Work Locations
Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
  - TX03.1 Power Generation and Energy Conversion
    - TX03.1.4 Dynamic Energy Conversion